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Concept of Multi-function Fusion Reactor

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To really use the fusion energy and make the fusion energy a main energy in the world could need more than 50 years. The construction of ITER starts the real course to realize the peaceful use of the fusion energy. It means the technologies developed in the world are feasible to built fusion facilities or reactors with core plasmas. To utilize its large volume nutron source, some of the conceptures have been proposed in the past twenty years, such as the fission-fusion hybrid reactor. Based on the technologies nowadays, a concept of multi-function fusion reactor (MFFR) is suggeted. MFFR has following functions: fission waste disposal, plutonium 239 producing by uranium 238, hydrogen producing, tritium producing, components test for fusion reactors.

The main considerations of MFFR are: (a) reasonable configuration and rechangeable in-vessel function modules, (b) enough flexibility to realize multi-functions seperately or at the same time in the facility, (c) liquid Pb-17Li cooling medium for tritium and hydrogen producing, (d) fully superconducting toroidal and poloidal magnets.

Based on the research on the new type clean nuclear energy system, high lever radiation waste and transmutation system in subcritical systems in the past years, the Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP) proposed the MFFR. In this paper, the concept of MFFR and some of the results will be introduced.